VOL. VII ITHACA, NEW YORK FASC. II

GENTES HERBARUM

Occasional Papers on the Kinds of Plants

THE PALM HERBARIUM

With remarks on certain taxonomic practices

by L. H. Bailey

Published by The Bailey Hortorium
of The New York State College of Agriculture
at Cornell University
(Mailed at Ithaca Post Office to regular list)
July 17, 1946

QK
3
.B16
v.7
pt.2

39. PALM TREE. How shall we put it into the herbarium? At lower left, peak of a thatched building; at base of bole, sprawling tree of Cecropia. *Sabal umbraculifera* in Haiti.

Cyp
L. H. Bailey
7-31-46

ARTICLE 2.
THE PALM HERBARIUM.

We are learning in these later years that much of our confusion about the kinds of plants on the planet arises from preserved specimens that do not sufficiently represent the species or that are inadequate in some of the particulars; and the herbarium material is the last resort as to what the original author meant by his designation and description.

In the old days the herbaria were small. Cases to hold them were few and often unadapted to their contents. Frequently there was doubt by administrative authorities as to the value of dead dried plants, and whether an institution should house them. Every effort was made to keep the specimens as few as possible in order to conserve space, and the specimens themselves were small. Even at Harvard about sixty-four years ago I heard Asa Gray instruct his curator, Sereno Watson, to mount a specimen on an old sheet to save space, and Watson replied that he was tired of pasting one specimen over another; and Watson used another free sheet.

Nowadays we do not maintain an herbarium with the idea of saving space in it. In fact, we want it to grow and be large not alone to file away a species but to record its distribution far and wide and to show its variations under all conditions, and these are factors that cannot be represented and recorded in any other way. One specimen can no longer sufficiently represent a species. An herbarium is not a collection of souvenirs.

The specimens are dead, to be sure, but living plants cannot be kept or housed indefinitely, nor can one grow all the species of a large genus. An herbarium museum is a permanent record, and should be indestructible. It provides the active material for identification and study of living plants. In all cases of doubtful identity it is the key that unlocks the mysteries.

We are slowly learning how to represent a plant in the herbarium. With little herbaceous subjects the whole plant may be taken and pressed and mounted, root and all; it makes a fascinating object, expressing itself through generations of men. Larger plants must be represented by pieces, but information on stature and dimension and color and other features may be explained on the label or in written comments placed in envelopes or pockets. Thus the herbarium grows, and it becomes increasingly significant. We have now learned how to collect Rubus, Cucurbita, and other troublesome subjects so that the specimens fairly represent the plant, and we are beginning to understand the species. When specimens are very scant the recognized species are few; and having committed ourselves to these few we are loathe to recognize others and are likely to regard new

and dubious fragments as hybrids, thus burying our ignorance and our errors. The worker who makes new species may be criticized for recognizing them. One who knows a genus is a "splitter" to those who do not know it.

Good herbarium specimens are our only records of identities. If one works in genetics or breeding, in ecology, phytogeography, in archeology in which species of plants are concerned, the identification of the materials is essential; and however clear the identification may appear to be at the moment, even if made by an authority on the genus, there is no guaranty that it may not be challenged in years to come. If specimens of the involved species are not preserved, the work is indisputably in fault at the start.

THE PALMS

What shall we do with the palms, many of which are heavy and ponderous trees sometimes more than one hundred feet tall and bear clusters of flowers and fruits as long as a man? Recently in a far tropical forest I had a cluster of palm fruits that required two men to lift and to carry it. Leaves may be twenty or thirty feet long, with petioles stouter than a stout man's arm. The spathe or cymba may be woody and hard, and five to nine feet long. We cannot expect the early travellers to have taken recognizable parts of all these gigantic subjects, to transport them and to place them accessibly in the museums of the world. No wonder that the bases of palm taxonomy are so frequently inadequate in every way to the understanding of the plant, of which they are only small fragmentary pieces.

Commonly ripe fruits and seeds are not available when the flowers are ready for the collector. The Roystoneas, Euterpes, and a few others are partial exceptions. The ripening of the fruit may be two months to ten months or even more after pollination takes place. If the collector does not reside in the territory he must make arrangements with another party to collect the fruits later from the same plants. In one case I went to Demerara (British Guiana) in a successive year to secure the fruits from trees I had marked.

It is not alone the tall massive palms that make the trouble in dense forests but even the small and bushy ones that may grow there. These minors may be inconspicuous in the contest of foliage, and difficult to remove for photographing; and if they grow in close colonies the disturbance of them may obviate their botanical and essential characters.

Frequently the palms grow in deep difficult canyons or on steep mountain declivities. The llume or Gaussia of Puerto Rico is on inaccessible castellated limestone steeples high above the roads. All day I have hunted Raphia in water from knees to hips.

A good statement of the obstacles likely to confront the collector of palms in thick forests is contained in a letter from the late Ynes Mexia from Ecuador published in National Horticultural Magazine for April 1942 by Dr. O. F. Cook who was then founding the palm genus Ynesia: "I regret that so many of my photographs of the palms are so poor, but the difficulties in photographing them are terrific. The plants are generally in dense forest, which shuts out almost all the light, and added to that, the weather is almost always cloudy, while the humidity is high. Often it is misting or raining in these tropical forests. The palms are so big and the surrounding vegetation so thick that one can get no chance even to see them."

Only a few months ago I entered a forest so thick and dim that I lost sense of place and direction when I had pushed only twenty feet into it from a narrow roadway. It contained slender palms of which I could not observe the tops, and which are yet unknown to me.

Yet, not all the palms are cumbersome, nor are all the forests impenetrable or even difficult. Palms are never herbaceous, but they may be very small. Malortiea of Costa Rica is tree-like usually less than twenty inches tall when in full fruit. Some of the palms are vines climbing over brush and fences and forest vegetation even into tall trees. Many of them are shrubs, without definite trunks; some of them make dense colonies and hedges that are difficult to penetrate. Good numbers of them are fearfully armed with piercing spines. For the most part they dry quickly in the herbarium press, although leaves sometimes are likely to curl.

In this Fascicle I describe what is my own practice in collecting palm specimens, but the procedure cannot be essentially different from methods pursued by others. Perhaps I take more material than does the usual collector because it is my obligation to describe and publish, and therefore I should understand the species. The present pamphlet repeats some of the instruction on the collecting of palms of my paper of 1933 (Gent. Herb. iii, fasc. 1) which is now out of print but is still in demand; and many of the old pictures are again used.

The collected material of palms, as of chickweeds or sedges, must represent the plant. We start out with the hope that we have space at home to house and arrange the materials. We are to make a museum, even though we have only a converted barn to put it in. If space is niggardly, then do not take up the palms. We now have the great aid of photography; but it should be said that this accessory for the study of palms is not snapshots or color pictures, or films developed subsequently in some other country; one should know before leaving the territory whether the pictures show the plants and the parts plainly and accurately, with all the detail that is needed for satisfactory diagnosis. This means that one works with a tripod

and makes a definite focus. This, of course, requires personal hand developing, to take care of the varying exposures and to bring up the detail in each separate case. Merely pretty pictures and scenes are of little consequence.

If the collector is seeking the big palms he goes with a machete, perhaps an ax, heavy pruning shears, a saw, thick leather gloves, and sometimes a ladder and ropes. It is a man's job. It takes time. Some of the challenges one meets are suggested in Figs. 39 to 43.

There are two elements in the collecting of palms: 1, find your palm; 2, stay until you get it.

If the palm is a large and heavy one in full flower or fruit and growing in a forest, I think I do well if I complete my photographing and collecting of it in one day, allowing for winds and rains. The first step is to photograph the tree as it stands, often from more than one angle. This may require cutting out the brush and removing objects that obstruct the view. I want the top of the tree, and the trunk to its base. I then get down a representative leaf, and I may have to photograph it on the ground, particularly on a smooth roadbed or sometimes against a wall or clean bank. The flower-cluster and the fruit-cluster are photographed in the same way if they are beyond the reach of the camera as they hang on the tree. The spathe is always shown. If the fruits are likely to change in size and shape in drying I photograph one or more of them separately, with a ruler or scale alongside to record dimensions. All this may require a half dozen exposures; if more than that, then the records are all the better.

I use either cut films or film-packs of the verichrome grade or class, and always make time exposures with a stop-down diaphragm. I do not use extra-fast film. My exposures are ordinarily on 4x5 inch or 5x7 inch films. The films are developed before I leave the region, so that I can check the results and repeat the exposures if necessary. Developed films are brought home in envelopes, numbered in ink to correspond with the field number of the collection, and prints may then be made for the herbarium, films and prints being filed together in the covers permanently.

If the palm is a large tree it may be necessary to cut it down; this of course may require permission from the owner of the property. If it cannot be felled, the collector looks for a lower tree or one that can be climbed or reached from a high bank. One must note at the outset where the inflorescence is carried in reference to the foliage,—whether amongst the leaves, or just beneath the leaves, or at considerable distance below with part of the trunk-like structure above it. This last position or structure was pointed out definitely and named by me in 1933 (Gent. Herb. iii, page 12). The structure above the inflorescence and below the leafy canopy may be several feet long. It constitutes a structural and constant difference between genera,

40. TERMINAL FLOWER CROWN of *Corypha umbraculifera*, the talipot palm of India, grown on Jamaica.

and compels us to separate Prestoea from Euterpe and to understand some of the difficulties in the Roystoneas. Of course this structure is not shown in herbarium specimens nor is it mentioned directly in the former descriptions of palms.

This structure between the inflorescence and the leaf-crown is not a trunk, nor does it have a bark with the marks of a regular bole. It is formed of the erect expanded sheathing petioles of the crown-leaves and contains at its center the long large terminal bud (which is eaten in the so-called cabbage palms). See Fig. 42. This structure I have named the crownshaft (*culmen superius*). Of course it is distinguished in a good photograph of the tree.

The standard texts speak of spadices or inflorescence as terminal (Fig. 40), infrafoliaceous (Fig. 42), and interfoliaccous (Fig. 41). To the second group belong those genera that exhibit a definite crownshaft, although that part had not been popularly named and clearly defined.

As I stated in the former paper, "there are many cases in which the cluster may appear either interfoliar or infrafoliar in the same species or even on the same plant, depending on whether the subtending leaf has fallen at the moment of anthesis. Some of the Chamædoreas are examples. These are really cases of interfoliar clusters. Morphologically, probably all clusters are axillary. This is the case even in Roystoneas and Archontophœnices, but the leaves have fallen well in advance of anthesis and a crownshaft has developed above the flower-clusters. For descriptive purposes, however, the distinctions are useful."

Usually the palm trunk is simple, straight, and unbranched. Rarely a trunk may fork or trifurcate when the terminal bud is injured; the mature coconut is seldom straight and in exposed places probably not even strictly erect. Certain palms, few in number in the oriental genus Hyphæne (see Fig. 43), have a pronounced forked branching habit. In many cases the species is acaulescent. All these stature characters are well brought out in photographs.

Specimens to represent the species of palms may be readily adapted to the sizes and practices of ordinary work, although in many cases the parts need not be mounted on sheets but are better placed loose in folders of herbarium size. The folder bears the label, and the specimen itself carries a numbered tag or ticket.

Big fruits, petioles, sections of large ligneous spathes (or cymbas) are kept in boxes or trays that fit into herbarium pigeon-holes. All such loose parts are provided with a merchandize tag numbered and legended to correspond with the label or the record in the notebook. Pieces of palms too big for the cases, cymbas, rampant clusters, hang on the walls of my

41. COCONUT TREE, with interfoliar flower- and fruit-clusters. *Cocos nucifera*, grown on Trinidad.

palm room not only as botanical specimens but as mementoes of zestful journeys.

Flowers should be preserved, as much as possible, in liquid in small bottles and filed with the other material, as well as also shown naturally in large numbers on the herbarium sheet or folder. Fortunately, palm flowers are small dry and glumaceous and make no trouble in the preparation process except that they may fall off, in which case they are assembled in quantity in envelopes; the axes or branches of the inflorescence should be pressed and preserved even though naked, for they are important in themselves and the scars show where the flowers were attached, male and female.

Often "extension covers" are used to hold bulky unmounted materials in their folders, the cover being one-half to one inch broader than usual and folded so that the back is broad (Fig. 44). How a case of palm specimens looks when the door is open is well seen in Fig. 45, in the author's herbarium. This picture shows ordinary herbarium covers, extension covers, boxes, tray, bottles, as readily in sequence as are the specimens in usual cases; this particular case shows some of the material assembled when I was working on the palms of Panama.

Leaves of palms do not present a serious problem to the herbarium collector unless they are of the large arboreous species. In low and shrubby soft palms, as Bactris, Chamædorea, Rhapis, the leaves are cut into pieces, the pieces folded and pressed, so that the entire blade and its petiole go directly into the herbarium. Very large and stiff leaves are saved only in part, at least one-half the blade being discarded. These leaves are of two groups,—the palmate or fan-shaped, represented in Sabal and Serenoa, Corypha, Pritchardia, Livistona, Washingtonia; the pinnate or feather-like, as Phœnix, Cocos, Acrocomia, Euterpe, Roystonea, Areca. In any case, the pieces of leaf-blades are made flat under strong pressure, with a heavier weight than one habitually applies to other plants; and the specimens should be put in press as soon as possible after they leave the tree, before the edges have begun to curl.

It should not be necessary to say that the leaf must be full size or full grown; yet often I have specimens made from juvenile leaves, apparently because they are easier to handle. Yet juveniles remain juveniles even after they are dead and dried, and they cannot be expected to show the characters of mature foliage.

Of a long large pinnate leaf, five or six pieces are taken from the blade. The tip is always preserved, and also the basal part of the leaflets or pinnæ. Intermediate parts are cut into a rachis length of perhaps 10 or 12 inches, pinnæ on one side are removed but the stubs of them are left to record the alternation, remaining pinnæ on the other side of the rachis are

42. ROYAL PALM, *Roystonea regia*, with infrafoliar flower-clusters and crownshaft above them. American tropics.

folded back and forth to the size of an herbarium sheet, and these pinnæ with the rachis go into the mounting folder inside the genus cover. Fig. 46 shows the result. Sometimes the lower pinnæ are wrapped around the rachis or petiole and the bundles kept in boxes (Fig. 47). Of course the label should record the entire length of the leaf, if it is large, as well as width. A good photograph of the whole leaf is a great aid.

Of a large palmate leaf one keeps the hastula or point of attachment of the petiole (Fig. 48), saves and cuts up the petiole itself so that the pieces may be filed in an herbarium box, then discards one side of the blade and cuts the other side or half into five to eight pieces to be folded and flatly pressed for the herbarium. Fig. 49 suggests the practice.

The entire flower-cluster is to be represented in the collection if one is to describe it accurately. Often the cluster is small enough to allow it to be folded and pressed and then regularly mounted, as in Chamædorea, Synechanthus, and some of the Geonomas. When the cluster is too large to press in its entirety, it may be photographed and then certain characteristic parts of it taken for pressing. In any case, separate flowers should be kept dry in envelopes or wet in bottles, so that the structures can be understood.

The spathe may present a special problem. In some cases the organ is represented in leaf-like parts or bracts, as in Sabal and Coccothrinax (Fig. 50) or in modified structures easily pressed. In other cases the spathe is a woody heavy durable covering organ or cymba with characteristic thickness, texture, armature or investiture, surface markings, as well as size and shape (Figs. 51 to 53). Such spathes should be photographed, as already stated (page 156), and then the organ is cut into lengths to be accommodated in the herbarium box or tray; if possible, all of it should be preserved, for it has diagnostic value in distinguishing species. An author cannot describe it unless he has it.

Fruits I have already discussed. Manipulation follows that advised for flowers. In many genera, the fruits are small enough to be accomodated on the herbarium sheet, as are those of Cratægus and Viburnum. Always the mature fruit is essential for clear identification and complete description of the genus or species.

The collector should be sure that he has the cupule or cup at base of the fruit, seen in Fig. 54, formed of the enlarged persistent perianth parts, and the fruit ripe enough to show whether the albumen is ruminate (Fig. 55).

The foregoing directions may seem to the reader to describe a too laborious process, but I know of no shortcut. These indications are prerequisites for knowing the palms. The student may not always be able to secure complete materials, and then he is at a loss in his work, even though

imperfect collections may be better than none. Fragmentary specimens mean fragmentary work.

In the preceding discussion I have spoken of the importance of obtaining all the parts from one tree. This does not mean that one tree may be sufficient to represent a species. If the collector notes suggestive differences

43. DOUM PALM of Africa, grown in Demerara, with forking bole. *Hyphæne thebaica.*

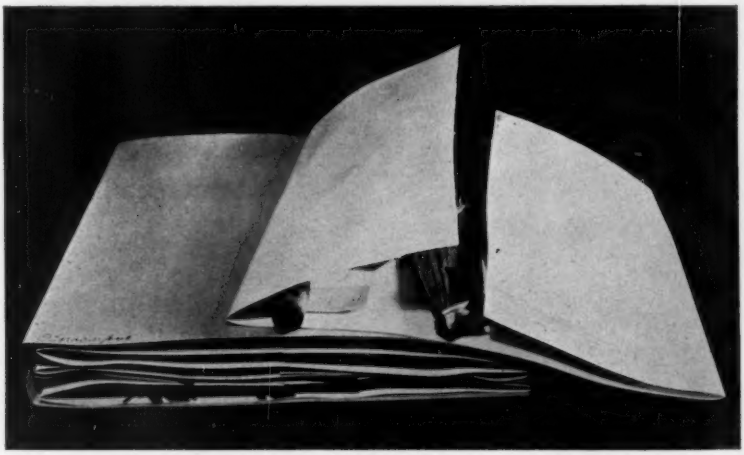
between different trees or bushes he naturally collects from each of them, as in other plants, to determine what the variations mean.

Many of the palm specimens that come to me for identification are hopeless for that purpose. Perhaps the reader of this paper will now understand the reasons why. Recently I had a small collection of palms from Africa, for name; they were juveniles and without flowers or fruits; of course I could not attempt to identify them.

How many palms

How many palms grow on the earth is unknown. It formerly was said that perhaps the species are 700, later 1100. I have lists of several thousands. It is doubtful whether more than one-half the species on the planet are yet named and described. Even many of the species that are clearly distinct in technical characters may not announce themselves offhand. Many good collectors do not attempt to attack the big palms.

Many plants popularly known as palms do not belong to the Palm family. Thus the traveller's palm, Ravenala, belongs to the Banana family, and the banana itself is often supposed to be a palm. Panama palm hats are not made from a palm but from a low plant with palm-like leaves belonging to the Cyclanthaceæ, *Carludovica palmata*. The sago palm is a cycad, and many members of the Cycadaceæ are popularly accredited as palms, as well as Curculigo of the Amaryllidaceæ.



44. HERBARIUM UNIT, consisting of an extended genus cover, and folded sheets (one of which is shown on top) containing specimens.

What, then, is a palm? In the first place, it is an endogen and monocotyledon, axes enlarging by internal accretions rather than by external or peripheral cambial layers. The perianth is regular, glumaceous, small, not

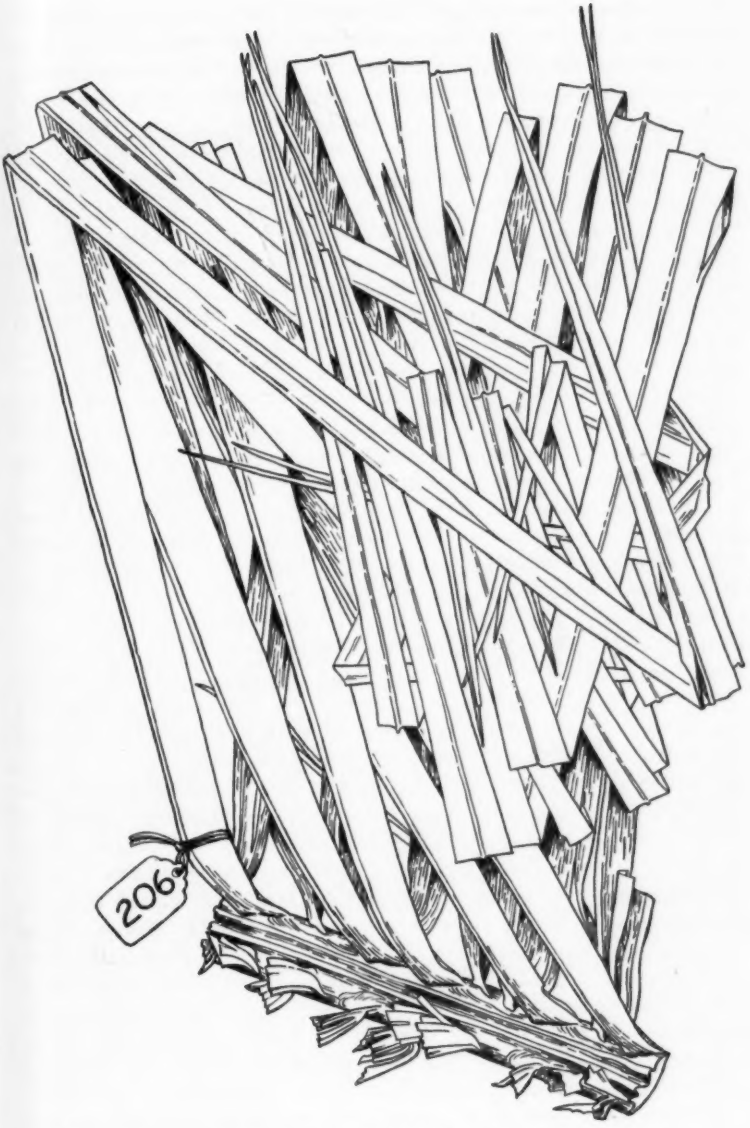
45. HERBARIUM CASE, door removed, to show the filing of palm specimens.

showy, calyx and corolla not differentiated, commonly very much alike; stamens in 3's, mostly 3 or 6, infrequently more numerous; ovary 3-celled or 1-celled by suppression, free from perianth, ovule solitary in each cell, embryo very small and immersed in albumen: fruit a small or large body, drupe-like or berry-like, the outer part commonly hard or shell-like: trees and shrubs with palmate or pinnate leaves, trunk usually erect and prominent but sometimes only a crown and in certain cases subterranean; others are vines. In Phytelephas the ovary is several-celled, and this genus has been erected into a separate family, although not commonly so treated.

As a family, the palms reach their greatest development in the tropics of both hemispheres, although some of them inhabit temperate and frosty countries as palmetto in the United States and Nannorrhops in snowy mountains of Afghanistan. With the exception of Raphia, no genera are represented natively in both eastern and western hemispheres, and there are suspicions that the occidental Raphias are naturalized from Africa. The American oil palm is now considered not to be congeneric with the African oil palm or Elæis. The regions from India to East Indies, and from Central America to northern and middle South America, are notable for the great numbers of genera and species of palms. Africa is not rich in genera and species although in parts abundant in numbers of palm trees, and it is noted for the date palm, to which Linnæus assigned the Greek name, Phœnix.

Whenever good and ample specimens have been made of a definite region or genus, the write-up of them is likely to increase the known number of species astonishingly. Thus, in publishing on the palms of Panama in 1943 I was confronted with twenty-six genera and thirty-one species; I published on twenty-eight genera (one of them being new) and sixty-nine species, thus more than doubling the inventory by new species based on the collections in hand. In that work I increased the species of Bactris from two to thirteen and of Chamædorea from seven to nineteen. In studying the much worked genus Sabal I have been obliged to increase the species from seventeen to twenty-six, and the end is not yet. When monographing the palm flora of the Mascarenes, east of Madagascar, a country in which the palms were supposed all to be known, I added one new genus to the four old ones and four binomials to the eight previously recognized. At the opening of the century we knew two species of the genus now called Roystonea; today we know seven of them, aside from botanical varieties. These various examples well represent the extensions that are likely to accumulate in the critical study of any palm territory or involved genus. Therefore we cannot yet state how many species of palms inhabit the earth.

The classification of palms has been inadequately formal, as may be seen by remarks on pages 28 and 29 of my Fascicle of 1933, of which the present paper is a revision. It is apparent that many students of the palms



46. PINNÆ OF PINNATE LEAF folded in the herbarium. Roystonea.

have not known them carefully in the field, and have depended too exclusively on materials in the herbarium. This is not the place to revise the subdivisions of the family or the tribes. In time to come we probably shall give more emphasis to the nature of the leaf-blade, whether palmate or pinnate, to armature, and to size and habit of plant and the general attributes of stature; the details of flower and fruit structure will define and verify the larger subdivisions. In a new treatment, the number of genera will probably not be less than 150; the species will be greatly extended.

The uses of palms are multiple and manifold. Natives in palm countries use the leaves extensively for thatching and for materials in the making of habitations, mattings and utensils. The wood is employed in buildings. In his pleasant book, Palm Trees of the Amazon, 1853, Alfred Russel Wallace writes "We have now glanced at a few of the most important uses to which Palms are applied, but in order to be able to appreciate how much the native tribes of the countries where they most abound are dependent on this noble family of plants, and how they take part in some form or other in almost every action of the Indian's life, we must enter into his hut and inquire into the origin and structure of the various articles we shall see around us."

Aside from native household construction and conveniences, the palms yield edible fruits, fibers, resins, waxes, oils, food products such as sago, wines, building and thatching materials, and are capable of yielding sugar in enormous quantities.

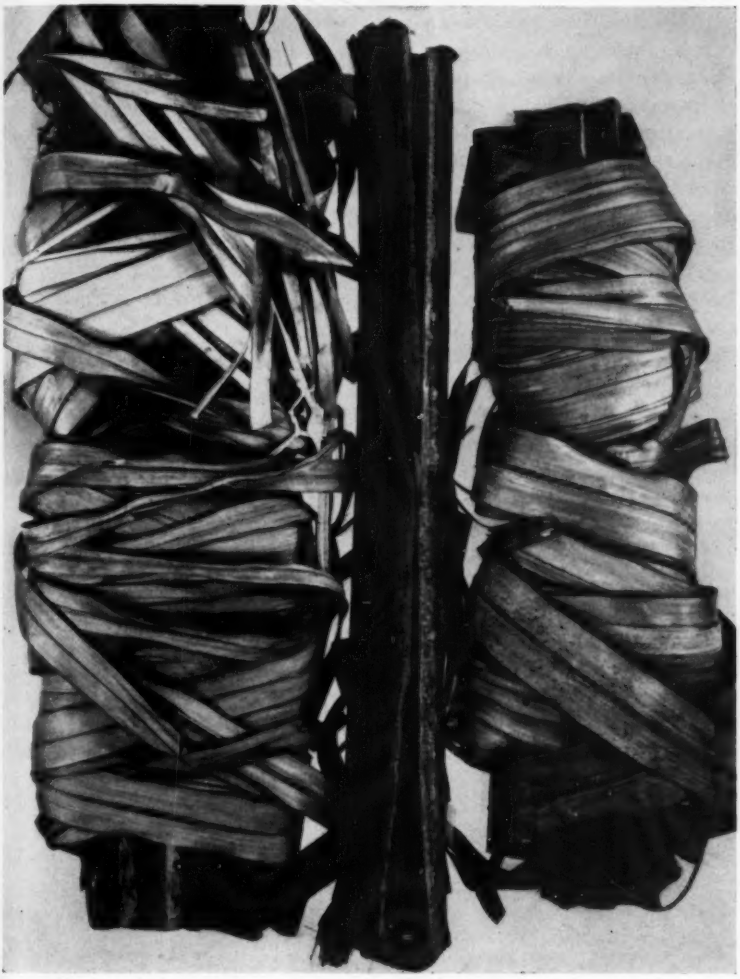
As ornamental subjects the palms are preeminent, both in their native countries and in subtropics, and young plants of a few species are common in greenhouses for decorative and exhibitional purposes.

Species-names with capital letters

The consultant of palm literature is likely to be struck with odd specific names spelled with a capital initial and that may not correspond with the generic name in gender nor represent any legitimate Latin adjective or genitive. He will note *Sabal Palmetto, Raphia Ruffia, Iriartea Corneto, Corypha Gabanga, Acrocomia Totai, Trachycarpus Takil, Areca Cathecu* (ordinarily mispelled *Catechu*), *Astrocaryum Murumuru* and *A. Tucuma, Attalea Maripa, Cocos Yatay, Hyphæne Argun, Areca Nibung, Bactris Maraja, Œnocarpus Batawa, Cyrtostachys Renda, Euterpe Manaele, Chamædorea Tepejilote.* These are an interesting set of oddities, picked up mostly from vernaculars, always recording a history or suggesting a flavor that should be recognized and preserved. They are nouns, printed in apposition, and constitute in themselves suggestive exceptions. They add quality to nomenclature.

Unfortunately there is no accepted uniform usage on the capitalizing of specific names. Linnæus nor the early fathers of botany did not establish

it. Taxonomy has grown up through the years, both in its content and in the use of its names. There is now strong tendency to reduce it to rigid formalities and to make it inflexible: this result would be deplorable. We should be prepared to avoid fixity in the programs of life.

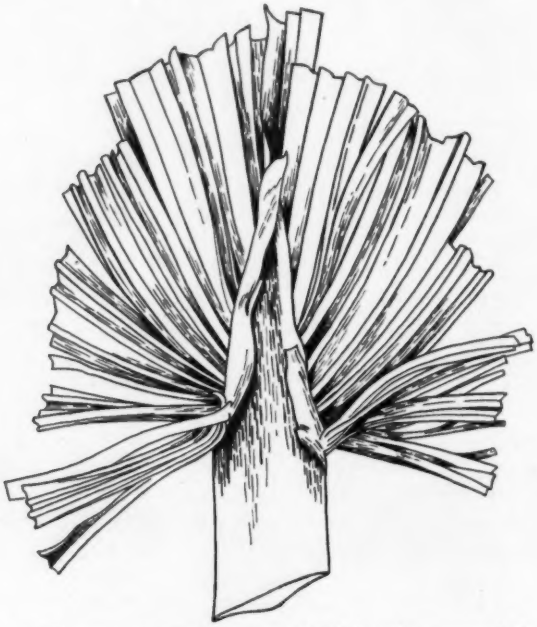


47. LOWER PINNÆ wrapped around lengths of the rachis and kept in a tray or box. In middle, part of manubrium, or handle of cymba shown in Fig. 52. *Scheelea zonensis*.

Species-names fall mostly into three categories: 1, adjectives, that are written in agreement of gender with the noun or generic name; 2, nouns in the genitive, conforming with their own history and structure; 3, vernacular nouns that are not declined and possess no classical genitive, therefore not in agreement with anything.

The adjectives are written in lower-case, unless they represent the names of persons, as *Johnsonianus, Hookeriana*, in which case they should follow the practice in Latin and other language and in which decapitalization would offend good literary taste and should also offend the person who is commemorated. It is no compliment to a man to decapitalize him. Geographic adjectives were once capitalized, but they are descriptive and indicative rather than proper names, are subject to great variations, and agree with the generic noun in gender. Custom now is to decapitalize them, and probably this practice will continue.

Nouns in the genitive, as *Johnsonii* and *Hookeræ*, should be accorded customary literary usage and they should also conform to good manners: they carry a capital initial.



48. HASTULA, OR CENTRAL PART, of Sabal, to be preserved. *S. glaucescens.*

Vernacular words, such as those quoted at the beginning of this discussion, are either barbaric names, or old generic nouns without customary placement; they are exceptions to ordinary rules and may not be declinable, yet they have meaning in themselves or at least historic significance and should not be minimized. They are employed in apposition to the generic noun and take a capital initial. They are capitalized to signify their etymology and not merely (as often stated) to follow tradition.

It is common assumption that species-names should be decapitalized as a concession to the faulty memory of those who use them, or to conform to a fetish of uniformity. These are not valid reasons. One might as well refer the whole question to the printer so as to simplify type-setting and proof-reading.

A writer or editor in taxonomy should know his subject well enough to write it intelligently and with regard to the niceties of language. That is his job. It should be his pleasure to exercise discrimination. If not, then we may as well invent a series of numbers or of symbols to designate the species of plants.

I am told that certain biologists and others uniformly decapitalize all specific names. Fortunately I am not obliged to imitate certain biologists and others.

There are, of course, strong arguments for decapitalization but they are based on the concept of uniformity, an idea that it is at least debatable. There is little likelihood of confusion in the alternative, and there is no pending procedure that would increase the accepted number of upper-case names.

We are confronted here with a scientific language, not merely with lists of names that may be modified to suit the convenience or the indifference of the user of them. In defense of decapitalization we are cited the practice of great printing offices that lower-case all species-names. This is not convincing, but rather raises doubts as to the desirability of a procedure that may fix an arbitrary domination and may not allow sufficient freedom to the worker. I could not myself allow the publication of a taxonomic paper under such restrictions.

A binomial is more than a name for a plant. It has history and significance. If decapitalization obscures this significance then it should be applied with caution. One who disregards the meanings is not sensitive to words, and he may deprive nomenclature of one of its interesting assets.

If an author must save himself trouble then he should go the limit and make all terminations uniform, for the ends of words are more troublesome than the capital initial: he should not be expected to bother his memory with *Areca alba* and *Dictyosperma album*, *Acrocomia aculeata* and *Astrocaryum aculeatum* and *Desmoncus aculeatus*. It may be said that these

terminations are part of the spelling of the words and cannot be changed, but so are capital initials part of the spelling of proper names; or if it is stated that to change them would violate agreements in gender so may it be stated that the placing of vernacular names in lower-case assigns them to an adjectival status with no agreement whatever.

Unfortunately the Rules of Nomenclature had not directly helped us in our predicament. The capitalizing of specific names is covered in Recommendation xliii of Article 70 in which the use of capitals is recommended, really made obligatory, in certain cases, although vernacular specific names were not mentioned. At the Amsterdam Congress in 1935, however, this Recommendation is amended to include vernacular names and two examples are cited, *Schinus Molle* and *Astrocaryum Tucuma* (Journ. Bot. lxxiv, 76). This definite action by an International Botanical Congress, confirming a practice of long standing, is not likely now to be changed.

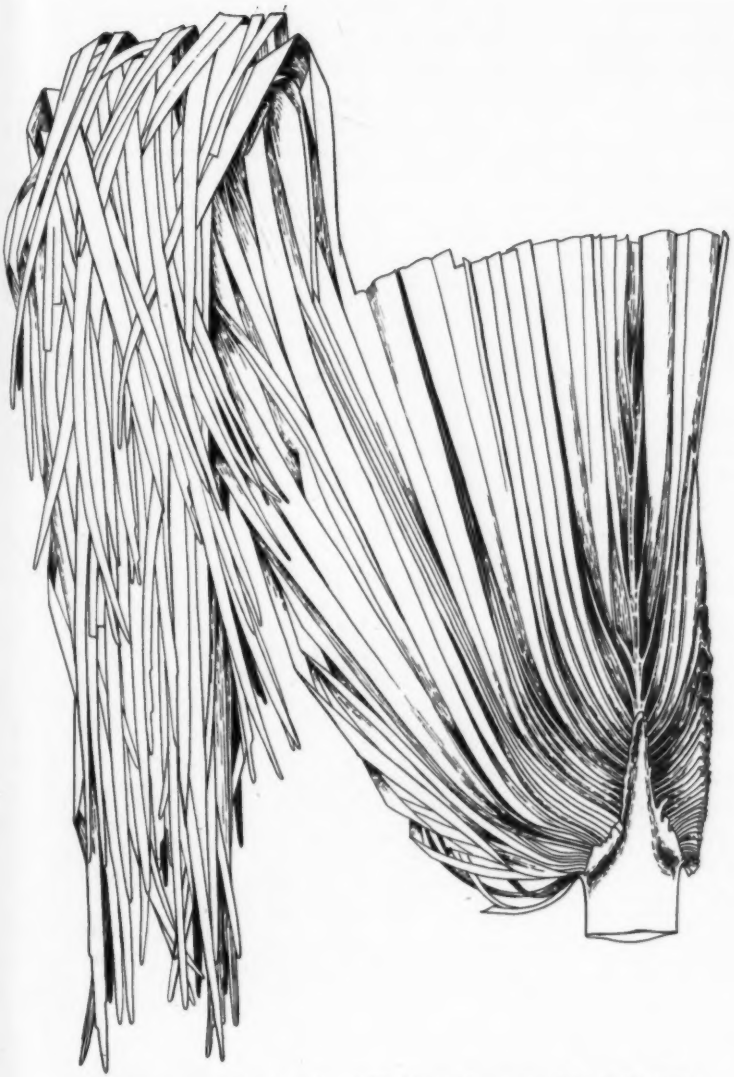
Recommendation xliii now stands as follows: "Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic or vernacular names (substantives or adjectives.)"

Another important Recommendation in this connection is number xlii, which provides that specific epithets be written in conformity with the original spelling of the words and in accordance with the rules of latinization. The initial is part of the spelling.

It is important and should be obligatory not to obscure the agreement and to hide the meanings. There is no agreement and no sense in *Polygonum convolvulus, Daphne mezereum, Convolvulus soldanella, Acacia julibrissin, Jatropha manihot, Brassica pe-tsai, Phaseolus mungo, Psoralea onobrychis, Zea mays.*

Consider *Pyrus Malus.* The noun *malus* means the apple-tree. Linnæus took over the name from Bauhin, in apposition, with a capital. The adjective *malus* means "evil" or "injurious." *Rubus malus* has meaning, but there is no significance or sense in *Pyrus malus.* Intention in the Pyrus case was to record a fertile history, in the Rubus case to designate a scratchy plant.

In 1944 I founded the species *Rubus Rosa.* In commenting on the name I wrote: "This great blackberry has the look in bloom of a handsome single rose; the flowers are also fragrant, and clusters in fresh bloom fill a room with a mild sweet odor. Of course I use the generic word Rosa as an appositive, as I have also made the title *Rubus Ribes* in apposition. I trust this epithet does not fall within the fashion adopted by some authors of writing all specific names in lower-case initials independently of their significance. There is no essential merit in this kind of formal uniformity. It is more desirable to attain reasonable diversity and to maintain the



49. PART OF LEAF, with hastula, of Washingtonia prepared for herbarium.

dignity of language and its grammar. To write this apposite in lower-case gives it the appearance of an adjective and in disagreement with its noun in gender; such use of it I shall regard as a misquotation." In spite of this explanation and warning, I now find a publication in which *Rubus rosa* appears. This is not the name I made. I shall now be obliged, in case I write again on this species, to cite *Rubus rosa* as a synonym.

It is not to be assumed that my presentation of the case of capitalization solves all the difficulties an author or editor may meet in the writing of binomials. There are many doubtful cases, as one may anticipate in a science as old and involved as taxonomy. Some of the cases must be solved on the basis of agreement rather than by rules that do not consider the reasons. It should be a pleasure for the scientist to investigate the doubtful occurrences as he attacks also the biological problems.

Other observations on binomials

Apparently my friends have not noticed that I use a comma between the species-name and the author of the binomial, since I have had no protests on the practice; I may as well explain while I am writing about names. I follow the use of the comma consistently and I think with ample reason, but I do not try to influence my associates to follow the example, however misguided I may know them to be. I may be the only one left who follows the older practice; I also am old.

50. SPATHE BRACT, at A, of fruiting cluster of Coccothrinax.

51. CYMBA OR SPATHE of *Bactris minor* in Colombia, with its emerging cluster of fruits; × ⅔.

52. CYMBA OR WOODY SPATHE of *Scheelea zonensis*, six feet long, showing the back or unopened side.

The comma stands for "of" or "by," as *Cimicifuga racemosa*, Nutt., "of Nuttall." Yet before me is a standard book in which I read *Cratægus apiifolia Michx.*, all in the same type. To the uninitiated this is a trinomial, or at least a real puzzle as to what "Michx." means or why it should be there. This tree may be planted by gardeners. They wish to know its name. What shall they call it?

Defenders of this trinomial tell me that the authority is part of the plant name and cannot be separated. This is nonsense. Whole books and encyclopedias are full of plant names without authorities. Nursery catalogues and dictionaries consistently employ the binomial system. I would not inflict another category on them.

There is now an unfortunate tendency to attach the authority to the binomial in botanical publications intended for popular and semi-popular use. This may add to the appearance of learning on the part of the author but it is wholly unnecessary and extraneous; it confirms the notion that authorities are part of the name. The case is particularly troublesome when the author uses the awkward and unessential double citation of authorities, with the involved parentheses.

Authorities were not cited in many of the early taxonomic books that we now quote. As the literature became more complicated we were obliged to cite the authority to make sure of what we meant. This will continue to be necessary in taxonomic work, yet it may mean nothing but confusion to the public. If we feel impelled to cite the authority we may at least insert the comma to indicate that the person's name is not part of the plant's name. This much is due the general reader of plant literature.

Probably in most books the authority is printed in a different type from the binomial itself. This is a great aid, but one should not be obliged, for his clarity, to rely on typography alone, and the typographer may not know: the case should stand on its merits and be evident in its own make-up.

My reasons for using the comma are perhaps sufficiently stated in the foregoing, and because I see no

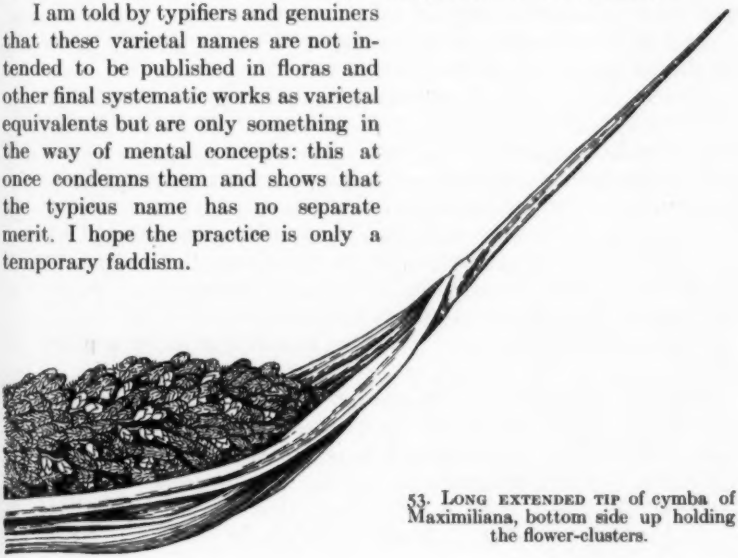
reason for taking it out; but principally I retain the comma because it belongs there to clear up the record. There is no prohibition against it.

There are reasons, that seem to me substantial, why I do not admit varieties *typica*, *genuina*, *originarius*, and the like when describing species. Thus, in monographing the queen palms (Gent. Herb. iv, fasc. 1, 1936) I cite *Arecastrum Romanzoffianum* var. *genuinum*, Becc. as a synonym of *Arecastrum Romanzoffianum*, Becc. for the reason that it is *Arecastrum Romanzoffianum* and cannot be anything else.

It is a current fashion to give the type specimen a new nomen when the original designation is the first and only indisputable name. I do not wish to duplicate and thereby confuse.

If it is desired to signalize the entity that was originally described then we should use the appellation originally proposed and acceptably published. If one wishes to contrast subsequent varieties with the original, I see no merit in inventing a trinomial for the original; we are only making a synonym. Contrasts can be made just as effectively and more clearly in the queen palms with *A. Romanzoffianum* than with any appellation that may be added to *Romanzoffianum*. Moreover, var. *genuinum* is not a variety at all; it is not a subdivision but a repetition. The original species-name may as well be dropped altogether except as a publication convenience.

I am told by typifiers and genuiners that these varietal names are not intended to be published in floras and other final systematic works as varietal equivalents but are only something in the way of mental concepts: this at once condemns them and shows that the typicus name has no separate merit. I hope the practice is only a temporary faddism.



53. LONG EXTENDED TIP of cymba of Maximiliana, bottom side up holding the flower-clusters.

We are drifting toward confusion in trinomial and quadrinomial nomenclature. I fear that reformation may be needed in days to come.

This question I discussed in some detail in 1945, and the statements may be found in Gentes Herbarum, v, page 912, under *Rubus parviflorus*, "The fieldfares."

Terms employed in palm literature

Armature. Any covering or occurrence of spines, barbs, hooks, that prick or scratch, on any part of the plant, independently of their morphology or origin. They may be on the trunk, petioles, leaf-blades, peduncles, spathes, rachillæ. In some cases, as in Desmoncus and the barbs of Calamus, they may be modified leaflets or pinnæ, and therefore have regular placement; usually the prickles are not borne in regular order.

Bole. The trunk, strong caudex. In some palms the boles are several or many in one stand, but commonly the plant has a single bole.

Coma (Latin, *head of hair*). Head; leafy crown of a palm tree.

Costapalmate, adjective. Designation of a palmate leaf in which the petiole or costa continues nearly or quite the length of the blade, as in Sabal and certain species of Livistona; continuation of the hastula.

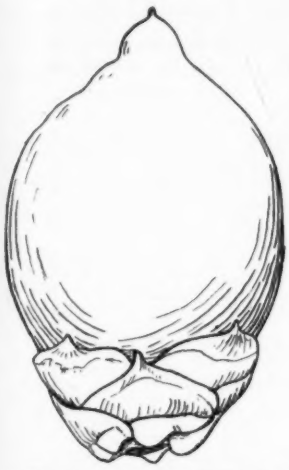
Crownshaft. Trunk-like extension of the shaft above the flower-cluster to the coma or crown, as in Roystonea and Euterpe; it is composed of broad sheathing petiole bases inclosing the terminal bud, and may be several feet long. Good photographs show the part, and it is an important mark of certain genera. In Latin, *culmen superius*.

Cupule. Cup-like permanent structure at base of mature fruit, formed by the dry and enlarging floral envelopes.

Cymba (Latin, *boat*). Woody durable spathe or spathe-valve that incloses the cluster of flowers and fruits, then opens and persists thereafter, from a few inches to several feet long. This boat-like structure is characteristic of certain tribes and genera. It should be recorded in photographs and preserved in the herbarium either full length in a box when small or cut into box-size lengths when more than 16–18 inches long. The surface texture and armature are important. In the cymbiferous palms the valves or parts of the spathe are commonly two to each inflorescence or spadix, one of which usually falls at or before full anthesis and is usually overlooked; the main valve becomes full length of the inflorescence and constitutes the usual cymba; often it projects into a long prominent beak.

Fruit. In the palms the fruit is an indehiscent drupe-like body of many sizes and conformations. It contains three seeds or seed cavities that may be reduced to one by suppression of one or two; sometimes in many-ovuled species few or several fruit parts are consolidated into one covered body, as in Phytelephas, each nutlet representing a developed locule. The fruit is enveloped in a hard shell, although the relatively thin exterior may be

either soft or fibrous; the interior is filled with albumen in which the small embryo is imbedded near the periphery; the albumen may be plane or else variously ruminate by intrusions from the walls; the albumen commonly hardens as the fruit matures, but in some cases (as Lodoicea) it is soft in the center and in *Cocos nucifera* remains liquid. The fruit is based in a persistent or fugacious cup or cupule formed of the perianth parts. Mature fruits are always obligatory in the herbarium.



54. CUPULE AT BASE OF FRUIT of Arecastrum in tropical America; somewhat enlarged.

Hastula (Latin, *little spear*). Terminal part of petiole on upper surface of leaf-blade of a palmate-leaved palm, sometimes called a ligule with which organ it may or may not be comparable. In costa-palmate blades it may be extended into the midrib or costa, but usually it is a short body having a definite termination.

Manubrium (Latin, *handle*). The long thin more or less cylindrical base of certain cymbas (Figs. 47, 52).

Nodifrond. Leafy nodal bract or spathelet subtending an inflorescence, in palms that are not provided with a cymba, prominent in Sabal and Coccothrinax.

Palman. Undivided part of palmate leaf between the petiole and segments of the blade.

Rachilla. Small rachis; branch, branchlet or twig of a spadix.

Ruminate, adjective. In palms the broken or divided brown or dark colored appearance of the albumen of the fruit or seed due apparently to intrusions of the inclosing walls.

Segment. Divisions of a leaf-blade not deep enough or separate enough to be called leaflets; applied particularly to palmate leaves, but sometimes used for the divisions or even the pinnæ of pinnate-leaved palms.

Sigmoid, adjective. Said of a leaflet or segment that is curved sidewise in opposite directions, like Sigma, the Greek letter S.

Spadix (Latin, *spike*). The flower-cluster or fruit-cluster, whether simple or compound.

Spathe. The bracts or expanded bodies (as cymbas) inclosing or attending the spadix,

55. RUMINATE ALBUMEN of *Euterpe globosa* of American tropics, the shaded parts representing intrusions from the walls; somewhat enlarged.

commonly comprising two parts or valves. A bract-like spathe of Coccothrinax is seen at A in Fig. 50. Two spadices are disclosed emerging in the picture (their peduncles barely shown), each one really bearing a spathe-valve although only one is shown in the drawing, the other one being lower down and out of view. If the long peduncle of either spadix were followed down to its origin, another more or less rudimentary valve or bractlet would be found about midway on the axis. The spathes or valves of Coccothrinax may not be morphologically comparable with the woody cymbas.